



# How does telework modify informal workplace learning and how can supervisors provide support?

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## Abstract

In our conceptional contribution to the journal “Group. Interaction. Organization.” (GIO), we analyze how telework affects informal workplace learning. Dynamic changes in the world of work require employees to continually adapt, and informal workplace learning is presumed to be an effective tool to cope with new demands. The accelerating use of information and communication technologies and the COVID-19 pandemic have led to an increase in telework. We integrate research findings to illustrate a modified learning infrastructure and develop propositions referring to the octagon model of informal workplace learning (Decius et al. 2019). For this purpose, we present a conceptual framework that demonstrates why telework reduces opportunities for informal learning due to social processes and role boundaries and increases opportunities via higher self-regulation. Furthermore, we develop ideas how supervisors could support informal learning by organizing social exchange, providing learning cues and resources, and design telework arrangements. Finally, we present implications for practice and future research with suggestions for the adaption of the octagon model for digital working contexts.

**Keywords** Telework · Working from home · Informal learning · Supervisors · Supervisor support · Octagon model of informal workplace learning

## Wie verändert Telearbeit das informelle Lernen am Arbeitsplatz, und wie können Führungskräfte Unterstützung leisten?

### Zusammenfassung

In unserem konzeptionellen Beitrag für die Zeitschrift „Gruppe. Interaktion. Organisation.“ (GIO) analysieren wir, wie sich Telearbeit auf das informelle Lernen am Arbeitsplatz auswirkt. Dynamische Veränderungen in der Arbeitswelt erfordern von Beschäftigten eine kontinuierliche Anpassung. Informelles Lernen am Arbeitsplatz gilt dabei als ein effektives Instrument zur Bewältigung neuer Anforderungen. Die stärkere Nutzung von Informations- und Kommunikationstechnologien und die COVID-19-Pandemie haben zu einer Zunahme von Telearbeit geführt. Ausgehend von den Unterschieden zwischen traditioneller Büroarbeit und Arbeit von zuhause integrieren wir Forschungsergebnisse, um Unterschiede der Lerninfrastruktur zu veranschaulichen. Wir entwickeln Annahmen, basierend auf dem Oktagon-Modell des informellen Lernens am Arbeitsplatz und stellen einen konzeptionellen Rahmen vor, der zeigt, warum Telearbeit Möglichkeiten für informelles Lernen aufgrund von sozialen Prozessen und Rollengrenzen verringert und Möglichkeiten durch ausgeprägtere Selbstregulierung erhöht. Zudem stellen wir dar, wie Führungskräfte informelles Lernen durch die Organisation des sozialen Austauschs, die Bereitstellung von Lernanlässen und Ressourcen und die Entwicklung von Telearbeits-Arrangements unterstützen können. Abschließend präsentieren wir Implikationen für die Praxis und zukünftige Forschung mit Vorschlägen für die Anpassung des Oktagon-Modells für digitale Arbeitskontexte.

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**Schlüsselwörter** Telearbeit · Arbeit von zuhause · Informelles Lernen · Führungskräfte · Unterstützung durch die Führungskraft · Oktagon-Modell des informellen Lernens

## 1 Introduction

Fast changing working contexts that derive from global competition and increasing digitalization require employees and organizations to constantly adapt. Ongoing development of competences has become an increasingly important strategic factor, hence informal workplace learning (IWL) is of growing interest (Tannenbaum and Wolfson 2022). IWL positively stimulates cognitive, motivational, and behavioral processes and gains in acquisition of skills and performance (Cerasoli et al. 2018). Besides *individual factors*, crucial antecedents for workplace learning are *organizational conditions* such as task characteristics, social relations, and learning opportunities (Decius et al. 2021c; Jeong et al. 2018). The COVID-19 pandemic accelerated the increase in telework (i.e., working from home), meaning that employees and their job tasks are relocated from the traditional office setting to remote working environments, physically separated from supervisors and colleagues. Telework is debated with respect to consequences for the individual, team and organization (e.g., performance, job satisfaction; Gajendran and Harrison 2007). To our knowledge, it has not yet been examined specifically how telework might act to alter IWL. However, there are a few studies that loosely deal with the two topics. For example, Bjursell et al. (2021) describe in their review about telework that it may have a broad impact on lifelong learning. Furthermore, in their empirical study on informal learning at work, Gerards et al. (2020) investigate news ways of working but do not specifically focus on telework. In this regard, by developing a framework, we try to make a strong theoretical contribution to explain the impact of telework on IWL.

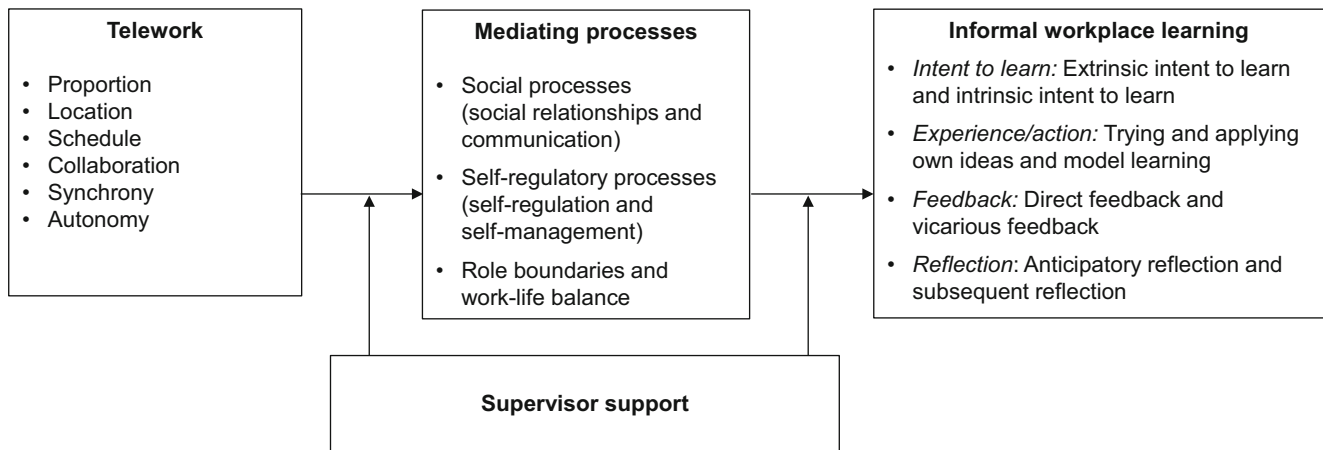
In our article, we develop a conceptual framework of how telework changes components of IWL. We argue that employees' separation from their traditional workplaces in their offices modifies spatial and temporal boundaries of work and the work's nature itself also affecting IWL. Corresponding with Allen et al.'s (2003) approach and Gajendran and Harrison's (2007) categorization, we focus on three telework-related processes that influence central work outcomes, more precisely *social relationships* (social processes), *self-regulation* (self-regulatory processes), and *role boundaries*. Furthermore, we develop suggestions how *supervisors* can positively influence these processes within the IWL framework (cf. Fig. 1). We base our propositions on the octagon model of IWL (Decius et al. 2019) and several other theories. By presenting our propositions within the conceptual framework, we aim to explain how telework modifies opportunities for IWL and discuss the role that supervisors can play in this context (cf. Table 1).

## 2 Telework

Information and communication technologies (ICTs) have a profound impact on the organization of work because they enable the detachment of work from the traditional office (Bosua et al. 2017). Digitalization and globalization are current key drivers for the significant increase of telework, and the COVID-19 pandemic accelerated this trend (e.g., Kauffeld et al. 2022). Nearly a quarter of all employed persons in Germany has worked at least occasionally from home in 2021 (Destatis 2022).

Various terms are used to describe working away from the workplace e.g., telework, remote work, mobile work, virtual work or new ways of working (Beauregard et al. 2019; Bailey and Kurland 2002). During the pandemic, the term “working from home” became common referring to employees working remotely from home, with and without formal telework regulations. In accordance with Nicklin et al. (2016) we refer to “telework” as ‘the proportion of job function(s) performed by an employee away from both other employees and the organization’s established physical base of operations, using various forms of information and communication technologies to maintain a virtual presence’ (p. 46). However, telework can vary widely in terms of a range of factors: Proportion (part to full time), location (fixed to mobile), schedule (fixed to varied), collaboration (low to high), synchrony (serial to concurrent), and autonomy (low to high; Nicklin et al. 2016). Hence, telework differs along these factors, and further between and within employees over time. Moreover, and in respect to traditional office work, telework varies in its similarities or differences to regular office work depending on the specific factors of telework and depending on the job itself (cf. Fig. 1). In turn, both forms can be regarded as a continuum, the boundaries are becoming increasingly blurred.

Telework is associated both with benefits and disadvantages organizations and employees perceive. While benefits are related with e.g., cost savings, higher productivity, higher work-life balance, increased flexibility, and higher job satisfaction, disadvantages include management of teleworkers, workplace culture, work-life blurring, isolation, and lower quality relationships (Bjursell et al. 2021; Bosua et al. 2017). So far, telework research has focused mainly on job attitudes, performance, and well-being, and has analyzed work characteristics, such as social support or perceived autonomy (Gajendran and Harrison 2007; Wöhrmann and Ebner 2021).



**Fig. 1** Proposed model of telework, informal workplace learning and supervisor support

### 3 Informal workplace learning

Work-related learning enhances the acquisition of knowledge, skills, abilities, and other resources (Tannenbaum and Wolfson 2022). These can be gained, for instance by learning on the job (informal learning), near the job (self-regulated learning) and off the job (formal learning; Decius et al. 2022). Formal learning is highly structured and institutionally organized (Tannenbaum et al. 2010) whereas self-regulated learning and informal learning are not. Self-regulated learning focuses on self-imposed learning goals while IWL concentrates on solving a problem that arises from the work itself (Decius et al. 2022). We refer to Cerasoli et al.’s definition (2018) for IWL who describe it as “... predominantly self-directed, intentional, and field based. Informal learning behaviors are not syllabusbased, discrete, or linear” (p. 204).

Forms of IWL are applying new ideas, looking how others work, asking colleagues about their experiences or reflecting about work. IWL takes place outside formally designated learning contexts (Decius et al. 2019). Although the majority of learning occurs in informal, “natural” learning settings, research and practical activities concentrate on formal training. One reason for this seems to be its sporadic, dynamic and self-guided nature (Tannenbaum et al. 2010). However, studies demonstrate the value of IWL for knowledge and skill acquisition, performance, and work-related attitudes (Cerasoli et al. 2018; Decius et al. 2021b, c). We aim at exploring how telework changes IWL and develop a theoretical framework. For this, we refer to the *octagon model of IWL*. It is in accordance with Cerasoli et al.’s (2018) definition of informal learning which is a multidimensional approach including motivational, cognitive, and behavioral processes (e.g., Tannenbaum et al. 2010). It builds on theoretical considerations, was applied to distinct groups (e.g., blue-collar and white-collar, students; Decius

et al. 2019, 2021a, c), and is operationalized by a validated measure (IWL scale; Decius et al. 2019).

The octagon model is an extension of the dynamic model of informal learning (Tannenbaum et al. 2010). It builds on eight components along four factors (Decius et al. 2019, 2021a): 1) Intent to learn with the components “*intrinsic intent to learn*” and “*extrinsic intent to learn*”, 2) experience/action with “*trying and applying own ideas*” and “*model learning*”, 3) feedback with “*direct feedback*” and “*vicarious feedback*”, and 4) reflection with “*anticipatory reflection*” and “*subsequent reflection*”. An individual may enter the learning process at any stage and undergo one or more of the eight components. Learning is presumed to be particularly efficient when all components are involved (Tannenbaum et al. 2010). The process includes intentional facets in the preparatory phase (intent to learn), behavioral facets in the action phase (feedback and experience/action) and cognitive facets in the consolidation phase (reflection; Decius et al. 2022). These behavioral facets of IWL are in accordance with behavioral elements of recent comprehensive frameworks, for example the CAM-OS framework by Tannenbaum and Wolfson (2022) which extends IWL behaviors further by different personal and situations readiness factors for enabling IWL.

### 4 Development of propositions

The focus of our theoretical paper is to explore how IWL is affected by changed working conditions due to telework and to develop a correspondent conceptual framework. For a systematization of the working conditions, we choose the categorization developed by Allen et al. (2003). They assume that telework generally affects work-related outcomes via three processes, namely social processes, self-regulatory processes, and role boundaries (cf. Fig. 1). This is in

accordance with Gajendran and Harrison's (2007) framework for the consequences of telework which states similar psychological mediators: Relationship quality corresponds to social processes, perceived autonomy to self-regulatory processes, and work-family conflicts to role boundaries. In terms of IWL, we refer to the octagon model of IWL and the input-process-output model of IWL by Decius et al. (2021c), which includes working conditions that facilitate and hamper IWL. We combine these with Allen et al.'s (2003) categorization and develop propositions and a theoretical framework how telework modifies IWL. For this, we apply theories from work and organizational psychology (e.g., job demands-resources theory, Bakker and Demerouti 2017; self-determination theory, Deci and Ryan 2008), theories regarding telework processes (e.g., border theory, Clark 2000) and recent empirical results. Along these three processes we demonstrate their specifics in respect to telework compared to traditional office work (cf. Table 1, row a).

Furthermore, we take our analysis one step further by identifying approaches to support informal learning among teleworkers. Here, we address specifically the role of supervisors and clarify how they can support IWL of teleworkers. The basis for our considerations is research on e-leadership (e.g., Avolio et al. 2000; Contreras et al. 2020) and the main theory in this context, DeSanctis and Poole's (1994) adaptive structuration theory. Our conceptual framework with the assumed associations and possibilities of supervisory support are displayed in Table 1 in detail. Here, we emphasize that the expected effects depend on the specific characteristics of telework because research recommended to consider telework as a continuous rather than a nominal variable (e.g., considering telework extent; Gajendran and Harrison 2007; Sardeshmukh et al. 2012; Wöhrmann and Ebner 2021). We assume not only effects of telework frequency (i.e., proportion) but also in respect to other factors (e.g., collaboration, synchrony). Therefore, the expected effects of telework on IWL represent a rough and average expectation, and they may vary according to the accentuation of different characteristics (e.g., proportion, collaboration, autonomy).

In the following we develop three propositions according to the assumed mediating processes and one proposition according to the role of supervisors. Due to text length restrictions, we display our considerations in Table 1: Illustrations in terms of propositions 1 to 3 are shown in columns 1 to 3 of Table 1 while illustrations regarding proposition 4 are shown in row c.

#### 4.1 Social processes, telework and informal workplace learning

Telework has implications for relationships and communication with supervisors and colleagues (cf. Table 1). In-

stead of face-to-face meetings, office talks, staircase conversations or joint lunch breaks, telework relies on electronic communication and collaboration tools (Allen et al. 2003; Bosua et al. 2017). In particular, teleworkers perceive firstly *less rich communication* cues and opportunities to give and receive feedback (Van Steenbergen et al. 2018). Communication channels differ in their information richness with face-to-face communication as the richest (e.g., Dennis et al. 2008). Due to the restrictions in telework, misunderstandings, weakened collaboration, and a decline in feelings of belonging are more likely to occur (Van Steenbergen et al. 2018). In addition, telework is characterized by more asynchronous communication compared to traditional office work, which can hamper communication performance as well (Dennis et al. 2008). Hence, appropriate means and IT-tools are important for an effective communication as technology determines the types of interactions (DeSanctis and Poole 1994). Secondly, the resources *social support* and *quality of relationships* decrease when employees telework extensively (Sardeshmukh et al. 2012). Thirdly, *isolation* is another factor triggered by telework. Despite networking possibilities, frequent telework is related with higher perceptions of social and professional isolation due to fewer face-to-face interaction, lower social presence and fewer learning opportunities (e.g., Beaugard et al. 2019). As (social) relatedness is a basic psychological need for motivation (Deci and Ryan 2008), perception of isolation could reduce motivation to IWL as well.

Due to these modified social processes, we expect fewer opportunities for all IWL components (e.g., extrinsic intent to learn, direct feedback) because social relationships are a significant antecedent of IWL (Cerasoli et al. 2018; Decius et al. 2021c; Jeong et al. 2018). Learning from others is a central resource for IWL (Noe et al. 2013), and social support enables receiving feedback, applying model learning and fosters motivation and engagement (Bakker and Demerouti 2017; Hüffmeier and Hertel 2011). Clearly defined structures and social routines provide learning opportunities via knowledge exchange and feedback (Beaugard et al. 2019; Welk et al. 2022) but interaction in telework is more formally scheduled and less informal than interactions in the office (Bjursell et al. 2021). Depending on how much the job is characterized especially by collaboration (low vs. high) and schedule (fixed vs. varied), telework affects social processes and therefore IWL to a different extent. Thus, telework likely reduces social processes which play a fundamental role within the octagon model; consequently, we assume that telework modifies IWL (cf. Table 1, column 1).

**Proposition 1** Telework reduces opportunities for IWL via social processes.

**Table 1** Conceptual framework of telework specifics, anticipated consequences for informal workplace learning (IWL) and possibilities for supervisor support

Processes	1) Social processes	2) Self-regulatory processes	3) Role boundaries
<b>a) Specifics of telework vs. traditional office work</b>	<p><i>Quantity of relationships:</i> Fewer opportunities for incidental social contacts, informal communication and meetings; fewer opportunities to perceive how others work; less stimuli for learning by colleagues</p> <p><i>Quality of relationships:</i> Digital and virtual communication, less rich communication; more asynchronous communication; lower quality of relations with coworkers; less social support from colleagues and supervisor; less exposure to organizational values, meanings and standards</p>	<p><i>Time management:</i> Private (vs. collective) time allocation; higher self-regulation opportunities and requirements due to higher autonomy and time control</p> <p><i>Availability:</i> Higher self-regulation needs regarding expectations concerning availability</p> <p><i>Disturbances:</i> Fewer work-related social disturbances, interruptions, and conflicts</p>	<p><i>Disturbances:</i> Less work-related interruptions; more private-related disturbances due to less segmentation of life domains</p> <p><i>Role conflicts:</i> Less work-life conflicts; easier role transitions due to higher integration</p> <p><i>Role ambiguity:</i> Higher role ambiguity due to poor communication</p>
	<p><b>b) Anticipated consequences of the respective process for teleworker's IWL and its components</b></p> <p><i>Intent to learn:</i> Less pronounced due to less learning stimuli and less social identity cues</p> <p><i>Experience/action:</i> Less pronounced due to less learning stimuli and less social identity cues; less model learning</p> <p><i>Feedback:</i> Restricted feedback from colleagues and supervisors; higher inhibition to ask for feedback due to less informal communication; less feedback and in turn less motivation to learn and reflect; more structured and goal-oriented feedback-seeking due to less informal communication and less external feedback</p> <p><i>Reflection:</i> Less pronounced reflection due to less stimuli</p>	<p><i>Intent to learn:</i> More opportunities and pursuing of professional goals; more intrinsic intent to learn</p> <p><i>Experience/action, feedback and reflection:</i> More (concentrated) opportunities for experience, feedback and reflection due to higher autonomy; more self-discipline and proactivity necessary to reserve and use flexibility for experiencing, reflection and gathering feedback from colleagues and supervisors</p>	<p><i>Intent to learn:</i> Less intrinsic and extrinsic intent to learn due to unclear role expectations</p> <p><i>Intent to learn, experience/action, feedback and reflection:</i> Less learning triggers due to less spontaneous work-related interactions and in turn less intrinsic and extrinsic intent to learn, experience, seeking feedback and reflection; less opportunities for IWL due to higher private distractions</p>
<p><b>c) Possibilities for supervisors to support IWL</b></p>	<p><i>Social exchange:</i> Introduce routines for informal communication; stimulate professional exchanges e.g., by strengthening task interdependence; provide resources for sharing experiences; apply communication-enhancing technologies; organize fixed team attendance days to facilitate knowledge sharing, identification and to improve social relationships</p> <p><i>Feedback:</i> Offering feedback and model learning</p> <p><i>Trust:</i> Create trust within teleworking teams to enhance knowledge sharing, reduce professional isolation and ensure an error-related learning climate</p>	<p><i>Resources:</i> Create informal learning opportunities by e.g., defined learning times; discuss and clarify availability times; professional support of self-regulation strategies</p> <p><i>Motivation:</i> Communicate the usefulness of IWL; create a communication routine that encourages experience, feedback and reflection</p>	<p><i>Clarification:</i> Discuss productive times that meet private and professional needs; reduce role ambiguity by expressing tasks, responsibilities, and goals; address risks of work-life conflicts; clear availability expectations and enable undisturbed times</p> <p><i>Motivation:</i> Offer extrinsic incentives and support intrinsic intents to learn to specify role expectations</p>

## 4.2 Self-regulatory processes, telework and informal workplace learning

ICTs enable employees to choose the place and the time to work and make decisions flexibly without direct supervision (Kauffeld et al. 2022). This increased *autonomy* is presumed to be a core job resource to achieve work goals and stimulate personal growth, learning and development (Bakker and Demerouti 2017). Also, according to self-determination theory (Deci and Ryan 2008) it fulfills personal needs.

However, autonomy requires self-leadership and self-regulating behavior (Bandura 1991; Mander et al. 2021), i.e., high autonomy enables and requires self-regulation for teleworkers (cf. Table 1). While ICTs offer flexibility and control over communication for employees, they simultaneously generate feelings of constant availability leading to a perception of reduced autonomy (e.g., Kauffeld et al. 2022). This “*always-on culture*” can be linked to the mutual investment approach (Tsui et al. 1997), according to which employees are willing to contribute more time because they receive the employer’s benefit to work remotely (Charalampous et al. 2019). These perceptions might add to further self-regulation needs. This is contrasted with office routines (e.g., breaks) that can provide structure and reduce the need for self-regulation. However, teleworkers do not experience disruptions that are typical for work situations in the office (e.g., requests, informal conversations, office-based politics) which reduces stress, enhance the chance to focus on tasks more effectively, and strengthens autonomy in self-management (cf. Beauregard et al. 2019).

Concerning IWL, autonomy is a relevant antecedent for the self-directed character of IWL for several reasons (Cerasoli et al. 2018; Decius et al. 2021a). Firstly, employees need sufficient resources to intentionally engage in IWL. An autonomous functioning implies opportunities for planning one’s productivity to work more efficiently and for learning opportunities, i.e., applying new ideas, seeking tips and experiences from colleagues, or reflecting on learning processes and experiences. Secondly, flexibility can foster IWL and intrinsic intent to learn due to the positive motivational influence of autonomy (Bakker and Demerouti 2017). Whether employees take advantage of autonomy or not depends on their self-regulation abilities and individual predispositions (Decius et al. 2021c), and on their social embeddedness and role boundaries (see below). Table 1 (column 2) shows in detail how self-regulation may affect IWL and its components. Again, we assume that telework affects self-regulatory processes and therefore IWL to a specific extent, depending on the telework characteristics itself (e.g., proportion, schedule, or synchrony). Thus, we propose the following:

**Proposition 2** Telework increases opportunities for IWL via self-regulatory processes.

## 4.3 Role boundaries, telework and informal workplace learning

Whereas office work indicates clear separations in time and place from work and nonwork domains, telework often has highly integrated roles with flexible and permeable boundaries between both (Allen et al. 2003). On the other hand, telework allows individuals to fulfill both work and private responsibilities and combine roles more easily (Beauregard et al. 2019). Research indicates less *work-family conflicts* for teleworkers (e.g., Gajendran and Harrison 2007). According to border theory (Clark 2000), employees differ in their preference and possibilities to segment or integrate their professional and private roles. In line with this, time flexibility allows employees to schedule work optimally, hence the negative effects of blurred boundaries and *role conflicts* can be diminished (Lott and Abendroth 2022). Similarly, telework indicates less role conflicts because employees have a greater control over disruptions, perceive less interruptions and less unanticipated work-related requests (Sardeshmukh et al. 2012; Wöhrmann and Ebner 2021). However, blurred boundaries are also related to *role ambiguity*, which is demanding and occurs when employees lack clear information about their role (Bakker and Demerouti 2017). Role ambiguity is higher for teleworkers because they face limited communication cues within interactions regarding requirements for private and professional roles (Sardeshmukh et al. 2012).

If teleworkers perceive a better balance of private and professional demands, time gains could generally increase opportunities for IWL because time allows reflection, feedback and trying to realize own ideas (Jeong et al. 2018; Marsick and Volpe 1999; Tannenbaum et al. 2010). On the other hand, blurred boundaries can also increase private interruptions and time pressure in the short-term which hampers engagement in feedback seeking and reflection (Wolfson et al. 2019) and cause stress, diminish learning performance and motivation to learn (Cerasoli et al. 2018). In addition to role conflicts and time-based conflicts, role ambiguity is relevant for IWL. It is linked with team conflicts and less psychological safety due to unclear roles and tasks, which in turn hampers IWL (Frazier et al. 2017). Table 1 (column 3) displays potential effects of role boundary management requirements for all components of the octagon model in more detail. Here, we would like to recall the telework factors (especially e.g., location, synchrony, schedule) that may affect role boundaries and in turn IWL. Hence, we propose the following:

**Proposition 3** Telework reduces opportunities for IWL via role boundaries.

#### 4.4 Supervisor support, telework and informal workplace learning

Generally, reviews on IWL demonstrate supervisor support as a significant situational antecedent for IWL (Cerasoli et al. 2018; Decius et al. 2023; Tannenbaum and Wolfson 2022). However, telework enables and forces supervisors to redefine their role (Avolio et al. 2000; Dambrin 2004), and Contreras et al. (2020) report in their review that supervisors need to develop ‘new abilities to establish a strong and trustworthy relationship with their employees to maintain their competitiveness’ (p. 1). This is in line with adaptive structuration theory (DeSanctis and Poole 1994) that assumes that ICTs transform leadership and possibilities for supervisory support. For several reasons, we assume that supervisors are in a crucial position to elicit benefits of telework and to foster IWL. Our considerations are based on various leadership styles (e.g., transformation, servant or empowering leadership). These include promising elements to strengthen IWL like ‘intellectual stimulation’, ‘individualized consideration’, ‘helping subordinates grow and succeed’ and ‘empowering subordinates’. We pick up on these in our descriptions below and in our suggestions (cf. Table 1, row c).

First, research shows the significance of leadership for work-related outcomes within telework arrangements (Beauregard et al. 2019). Prior results demonstrate positive associations between telework conditions and *employee-supervisor relationships* (e.g., Gajendran and Harrison 2007). Possibly due to the lack of direct observation, supervisors are paying greater attention to structure communication in telework. Brown et al. (2021) emphasize the significance of task-focused and relationship-focused leadership for *virtual team performance*. Lott and Abendroth (2022) further indicate the importance of *trust and fairness* of supervisors concerning their employees’ affective commitment in virtual work settings.

Second, supervisors can shape the three described processes that trigger telework to strengthen IWL. Regarding *social processes*, they could promote informal communication, social support, a learning climate, and trust (e.g., Decius et al. 2021c), and make decisions concerning task interdependence, technical and software applications, communication forms and intensity (Dennis et al. 2008; Maruping and Agarwal 2004; cf. Table 1, cell 1c). In terms of *self-regulation*, they can regulate expectations concerning the employees’ availability, and strengthen employees’ self-regulation capabilities (Tannenbaum and Wolfson 2022; cf. Table 1, cell 1b). With respect to *role boundaries*, supervisors could reduce role ambiguities and assist in establishing

a better work-life balance, for instance, offering team rules (cf. Table 1, cell 1c). Furthermore, supervisors can design telework arrangements concerning the frequency and flexibility of telework. Here, regular team attendance days may compensate for negative effects of telework. Also, Tannenbaum and Wolfson (2022) refer in their CAM-OS framework to the approach of manager support for strengthening IWL.

Lastly, supervisors can influence IWL directly (Decius et al. 2021c; Gerards et al. 2020; Zia et al. 2021). Referring to the octagon model, supervisors can *design IWL conditions* proactively by creating feedback routines and act as a learning model. Similarly, the work design growth model (Parker 2017) emphasizes that work design (and thus the design of telework) is a very promising approach for learning and development as work characteristics shape behavioral, cognitive and motivational processes and in turn support a change in skills and cognitive development. Additionally, they could initiate learning processes by encouraging teleworkers to try out new ideas or creating extrinsic learning incentives. These opportunities tie in with Ellinger and Cseh’s study (2007), showing that learning-committed leadership supports IWL because supervisors can serve as developers, visibly making space for learning, or instilling the importance of sharing knowledge. Depending on the specific design of telework (especially e.g., collaboration, schedule), this can be achieved to varying degrees. In general, we propose that supervisors can foster IWL in telework arrangements.

**Proposition 4** Supervisor support can beneficially affect the relationship between telework and IWL.

## 5 Discussion

Telework shifts work to private spaces, and it is associated with flexibilization and adaptation necessities for employees. Working physically distanced from peers and supervisors changes work habits and opportunities for IWL because social exchange is impaired and requirements of self-regulation and role boundary management increase. Our conceptual framework describes how these modifications affect all components of the octagon model of IWL defining a changed learning infrastructure. Opportunities for IWL are diminished due to restricted communication, reduced social relationships and fewer learning cues. Concerning autonomy, this resource increase by telework, allows for more opportunities for IWL and requires likewise more self-regulation. In sum, employees are more left to their own resources, and it depends on their skills regarding social processes, self-regulation and role boundaries how well they cope with these changes. As supervisors could

**Table 2** Recommendations to adapt Items of the IWL scale to telework arrangements

IWL components	Adaptations
<b>Experience/action<sup>a</sup></b> (Trying and applying own ideas, model learning)	Expand sources for learning with respect to non-personal resources and new media. ( <i>'I search for physical and digital resources to learn something new.'</i> <sup>b</sup> ) Emphasizing self-regulation needs. ( <i>'I consciously take time to try out new ideas.'</i> <sup>c</sup> ) Emphasizing rich communication for model learning. ( <i>'I use rich communication channels to understand how others work.'</i> ) Reference to the organization's place can be omitted ( <i>'I look at how others work [in the company] to improve my work.'</i> <sup>c</sup> )
<b>Feedback</b> (Direct feedback, vicarious feedback)	Emphasizing self-regulation needs. ( <i>'I consciously take time to ask for feedback.'</i> <sup>c</sup> ) Emphasizing rich communication ( <i>'I use rich communication channels to receive feedback.'</i> )
<b>Reflection</b> (Anticipatory reflection, subsequent reflection)	Distinct focus on the learning process for knowledge work. ( <i>'I think about how I could improve my learning process.'</i> <sup>b</sup> ) Emphasizing self-regulation needs. ( <i>'I think about whether I have sufficient learning opportunities to improve my work.'</i> <sup>b</sup> ; <i>'I consciously take time to think about how I can improve my work habits.'</i> <sup>c</sup> ) Emphasizing role boundary management ( <i>'I think about how I can organize my work to balance private and professional needs.'</i> )

<sup>a</sup>For the components "Intrinsic intent to learn" and "Extrinsic intent to learn", adaptations seem to be not necessary

<sup>b</sup>Adapted from Lee (2022)

<sup>c</sup>Adapted from Decius et al. (2019)

help maintain IWL, organizations should pay attention to these developments and promote supervisors to take advantage of their opportunities to support learning on the job. Our assumptions extend and support recent research about learning in digital environments, i.e., the significance of the socio-technical environment for the perception of learning opportunities (Decius et al. 2022) and of feedback for IWL in the context of new ways of working (Gerards et al. 2020).

### 5.1 Theoretical implications

We theoretically applied the octagon model of IWL to the specific context of telework and underline its relevance and appropriateness for virtual working contexts in general. Previously created for blue- and white-collar workers, the IWL scale should be expanded regarding telework. Adaptations could include the integration of further *sources* of learning like "learning from non-personal resources" (Noe et al. 2013) and "learning from new media" (Kortsch et al. 2019) into the model and into the related measure (IWL scale; Decius et al. 2019). This would enhance their application and considers the increasing use of media at work (cf. Table 2).

### 5.2 Practical implications

Our conceptual model provides relevant practical implications for the promotion of IWL in digital working contexts. Supervisors have several options at their disposal to design telework (e.g., frequency or flexibility of scheduling; Allen et al. 2003) and to enable opportunities for IWL

in everyday work (cf. Table 1, row c). HR management could further promote the value of IWL, train supervisors for instance regarding learning-committed leadership (e.g., task-related learning opportunities) and climate (Ellinger and Cseh 2007). Specifically, regarding IWL in knowledge work, supervisors may become a motivator and designer of those arrangements rather than a controller (Dambrin 2004). Further, Kemether and Mynarek (2023) emphasize the support of trust and informal relationships between employees (e.g., online escape games or informal meetings after the working day to improve team cohesion), and they recommend the development of communication principles for different communication channels. With respect to employees, HR management could also offer formal trainings to improve employees' skills in self-regulation, role boundary management, and in how they cultivate social exchanges while teleworking (Althammer et al. 2021).

### 5.3 Limitations and future research

First, we draw our propositions on a theoretical basis and on related empirical evidence, hence we encourage researchers to *empirically test* the propositions. As we focused our research on the described psychological processes rather than on single task characteristics, we recommend analyzing employees' perceptions of their telework arrangement with respect to social relationships (e.g., isolation), self-regulation (e.g., procrastination) and role boundaries (e.g., role conflicts) as well as the role of supervisors. *Longitudinal de-*

*signs* could study and prove *reverse effects* of IWL and working conditions (cf. Decius et al. 2021b).

Second, detailed *characteristics of telework* should be incorporated into future research as the importance of the extent of telework for work-related outcomes is demonstrated (e.g., Wöhrmann and Ebner 2021). We did not incorporate this in detail, but we assume that fewer telework day per week may compensate for potential detrimental effects for IWL. Future research should integrate additional characteristics to study effects on IWL (e.g., scheduling, policies, individual initiative, media synchronicity, task interdependence).

Third, the integration of *personal characteristics* can contribute to the understanding of the proposed associations because the management of social exchange, self-regulation, and boundary management refer to individual behaviors. Here, personality factors and learning-related motives are of interest to be analyzed in terms of telework. They are well analyzed with respect to IWL (Cerasoli et al. 2018; Decius et al. 2019) but are not in terms of telework. Further, the study of individual regulatory focus could provide helpful insights (Wolfson et al. 2019) as well as age-related variables such as experience and motivation to understand how individuals deal differently with telework conditions and use opportunities for IWL (Jeong et al. 2018).

To expand our research further, we recommend specifying the differences not only between *conventional* and *virtual learning*, but also concerning *simulated learning* (Wood et al. 2020). This could contribute to recognize the underlying processes as a function of the work environment. Lastly, future research should recognize *social inequalities* of IWL opportunities in age groups or professions (cf. Bjursell et al. 2021).

## 6 Conclusion

In conclusion, we theoretically investigated the impact of telework-related processes on components of IWL. Regarding social relationships, the modification of both the quantity and quality of social contacts may affect IWL. Supervisors could support employees' IWL by fostering social exchange, feedback and trust. Concerning employees' self-regulation, telework changes requirements of time management, availability, and disturbances. Here, supervisors could provide resources and motivation to enhance learning opportunities. Regarding role boundary management, role conflicts, role ambiguity and disturbances are affected aspects in remote working conditions. The clarification of expectations, to motivate employees to learn informally and to teach them how to learn informally could be helpful options to foster IWL. Overall, telework

changes the infrastructure for IWL, and supervisors should adapt to these changes and accompany employees proactively.

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